Into the Future: DoD's Transition to the High Level Architecture (HLA)

Presented to the 1997 I/ITSEC

HLA Transition Issues Team
December 4, 1997

HLA Transition Issues Team

- **In Sept 96 we instituted an HLA Transition Issues Team to foster cooperation among the Services, Joint Staff, Defense Agencies and DMSO regarding HLA transition**

- **Representatives have met regularly for the last year and have developed a coordinated, consensus approach to the implementation of HLA policy**

- **Team members participating in today's panel discussion**
  - **Lt Col Dean Illinger, Joint Staff J-8 SAMD**
  - **Ms. Lana McGlynn, Army M&S Office**
  - **Mr. Ray Miller, USAF/XOC**
  - **CAPT Jay Kistler, Dept of the Navy M&S Management Office**
  - **Dr. Mike Bailey, USMC MCCDC**
  - **CAPT Jim Hollenbach, DMSO**

Discussion Outline

- **Background**
  - DoD M&S Strategy
  - HLA development process
  - HLA policy, benefits
- **High Level Architecture Transition Support**
  - Supporting software
  - Compliance testing
  - Education/outreach
- **HLA Transition Plans of the DoD Components**
  - Reports, categorization
  - Two-phase action plan
- **Challenges and Opportunities**
- **Summary**
- **Audience Q&A** ***(submit by available 3x5 cards)***

DoD M&S Vision

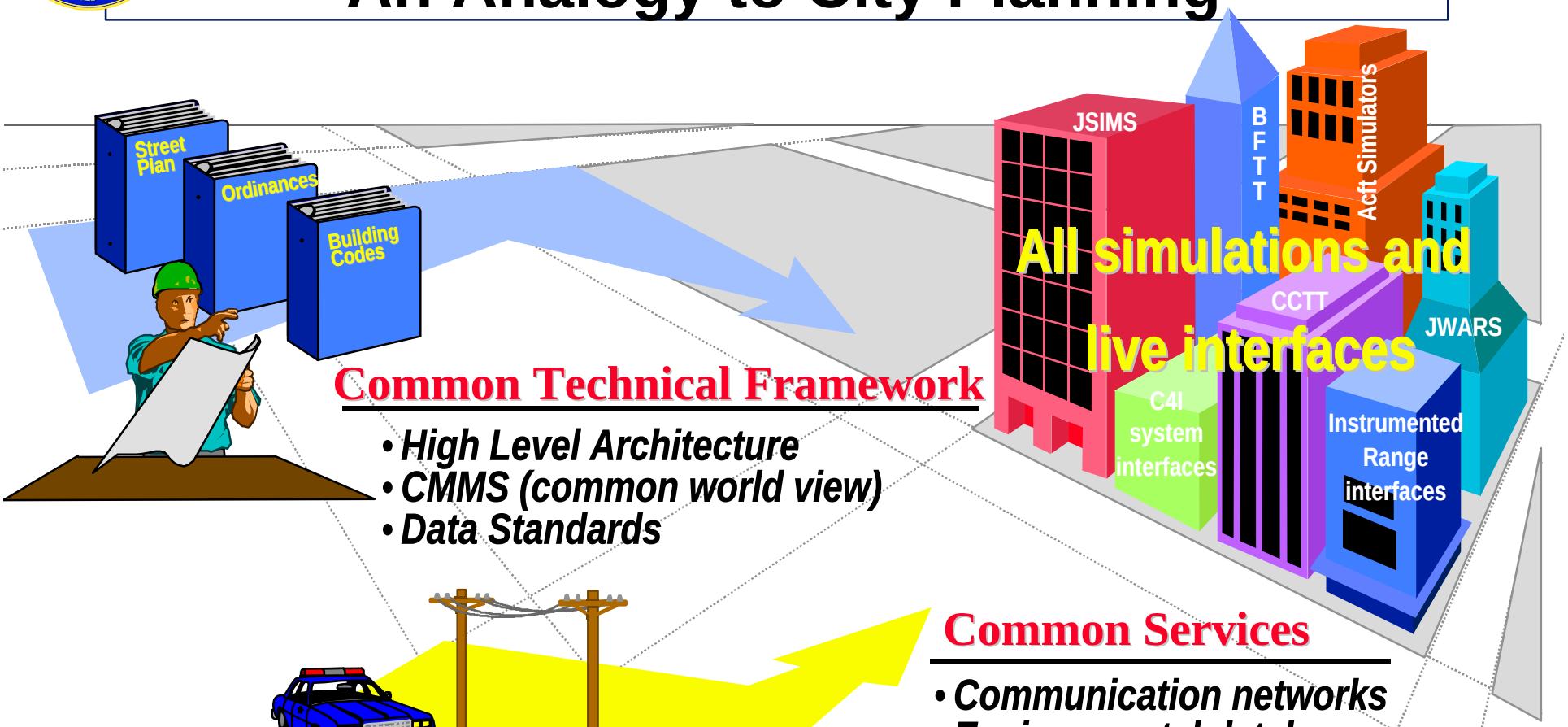
Defense modeling and simulation will provide readily-available, operationally-valid environments for use by DoD components

- **to train jointly, develop doctrine and tactics, formulate operational plans, and assess war fighting situations**
- **as well as to support technology assessment, system upgrade, prototype and full scale development, and force structuring.**

Furthermore, common use of these environments will promote a closer interaction between the operations and acquisition communities in carrying out their respective responsibilities. To allow maximum utility and flexibility, these modeling and simulation environments will be constructed from affordable, reusable components interoperating through an open systems architecture.

DoD Executive Council for Modeling and Simulation (EXCIMS), March 13, 1992

DoD M&S Strategy: An Analogy to City Planning



Common Technical Framework

- *High Level Architecture*
- *CMMS (common world view)*
- *Data Standards*

Common Services

- *Communication networks*
- *Environmental databases*
- *Resource repositories*
- *VV&A policy and procedures*
- *Help Desks (IAC & MSOSA)*
- *Supporting software/tools*

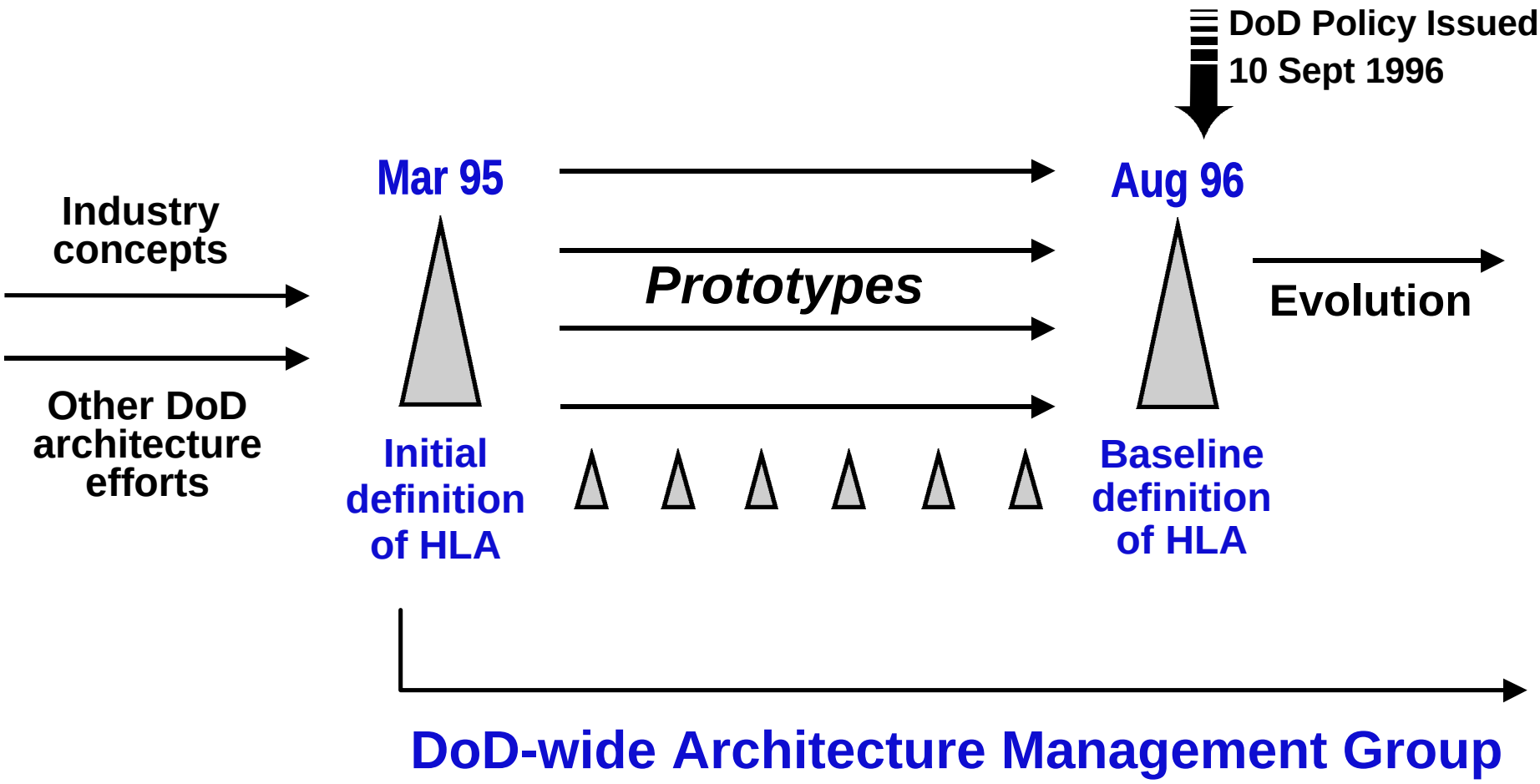
Payoffs: Interoperability and reuse = capability and cost-effectiveness

The Strategy is Being Executed Through a DoD-wide M&S Master Plan

Objective 1	*Objective 2*	*Objective 3*	*Objective 4*	*Objective 5*	*Objective 6*
Develop a common technical framework for M&S	Provide timely and authoritative representations of the natural environment	Provide authoritative representations of systems	Provide authoritative representations of human behavior	Establish a M&S infrastructure to meet developer and end-user needs	Share the benefits of M&S
Sub-objectives	***Sub-objectives***		***Sub-objectives***	***Sub-objectives***	***Sub-objectives***
1-1 High-level architecture	2-1 Terrain		4-1 Individuals	5-1 Field systems	6-1 Quantify impact
1-2 Conceptual models of the mission space	2-2 Oceans		4-2 Groups and organizations	5-2 VV&A	6-2 Education
1-3 Data standards	2-3 Atmosphere			5-3 Repositories	6-3 Dual-use
	2-4 Space			5-4 Communications	
				5-5 Coordination Center	

DoD 5000.59-P, Modeling and Simulation Master Plan, October 1995

High Level Architecture (HLA) Development Process Overview



Architecture Management Group (AMG) Member Programs

Original Members

- Advanced Distributed Simulation/Synthetic Theater of War (ADS/STOW)
- Battle Force Tactical Trainer (BFTT)
- Battlefield Distributed Simulation-Developmental (BDS-D)
- Close Combat Tactical Trainer (CCTT)
- Defense Modeling & Simulation Office (DMSO)
- DISA Leading Edge Services/Global Command & Control System (LES GCCS)
- Integrated Air Defense Simulation (IADS)
- Joint Advanced Distributed Simulation Joint Test Force (JADS JTF)
- Joint Modeling & Simulation System (JMASS)
- Joint Simulation System (JSIMS)
- Joint Tactical Combat Training System (JTCTS)
- Joint Warfare System (JWARS)
- National Air & Space Warfare Model (NASM)
- Naval Simulation System (NSS)
- Simulation Based Design (SBD)
- Test & Evaluation/Electronic Warfare (T&E-EW)
- Warfighters' Simulation 2000 (WARSIM)

New Members since Sept 96

- Computer Aided Modeling & Equipment Evaluation (CAMELEON)
- Distributed Mission Training (DMT)
- Wargame 2000
- JSIMS - Maritime
- Joint Virtual Laboratory (JVL)
- Mobile Analysis Support System (MASS)
- Modeling, Analysis & Simulation Center (MASC)
- Ventronics Simulation Facility (VSF)

AMG Membership Criteria

- The following procedure was approved by the EXCIMS at its September 1996 meeting
- AMG membership is to be based on following prerequisites:
  - nominated by a DoD Component M&S Management Office
  - programs currently involved in actual development of an HLA-compliant simulation, or modifying a simulation to make it HLA-compliant
  - folks with dirty hands, not oversight offices
  - government employee as the representative; contractors still involved, but can't vote
  - self-funded
- Component M&S Management Offices submit applications to DMSO for approval

Joint Staff Views on M&S

- **1995 Chairman's Program Assessment:**

  "*Lack of M&S interoperability is our largest shortfall*"

- **1996 Defense Planning Guidance:**

  "*Restructure M&S activities for interoperability & reuse*"

- **January 1996 Joint Requirements Oversight Council recognized:**
  - **immediate need for HLA benefits**
  - **conversion effort must be mandated to compete for $$**
  - **compliance dates & enforcement mechanism necessary**

DoD HLA Policy

- **DoD Policy:**

  "Under the authority of [DoD Directive 5000.59], and as prescribed by [the DoD Modeling and Simulation Master Plan], I designate the High Level Architecture as the standard technical architecture for all DoD simulations."

- **HLA supersedes Distributed Interactive Simulation (DIS) and ALSP**
- **"No Can" deadlines for legacy simulations:**
  - **"No Can Pay"- first day of FY99**
    - **no funds for developing/modifying non-HLA-compliant simulations**
  - **"No Can Play"- first day of FY01**
    - **retirement of non-HLA-compliant simulations**
- **Waivers must be decided on a corporate basis**

Dr. Paul Kaminski, USD(A&T)
10 September 1996

Some Benefits of HLA Use

- New capabilities (ownership transfer, smarter data distribution, etc.)
- Same infrastructure and interfaces can be used for a wide variety of simulation applications
  - large and small; real-time and managed time; local and distributed
- Simulations benefit from improvements in infrastructure technologies without having to pay for them
  - improved performance infrastructure can be inserted without an impact on applications
- Different organizations can produce/maintain a diverse set of products (e.g., simulations, live system interfaces, utilities, infrastructure) which can be (wisely) used together in different combinations as user needs dictate
  - yielding reuse of individual products
  - simulations can bring in new capabilities without having to build them

High Level Architecture (HLA)

Transition Support

HLA Transition Support:
HLA Evolution under the AMG

- **AMG will continue as DoD's means to manage HLA evolution and to support corporate decisions regarding M&S standards**
- **A disciplined issue identification/resolution process, a Technical Support Team, and experimentation are in place to ensure measured, professional evolution**
- **Six-month update cycles; HLA spec v1.2 was released in August**
- **Anticipate transition to IEEE standards once approved and evaluated by DoD**

HLA Transition Support:
Supporting Software

- **HLA is an architecture, not software**
- **However, to facilitate cost-effective implementation of HLA, DMSO is:**
  - **developing an initial suite of HLA supporting software**
  - **providing open distribution of this software in the public domain**
- **To foster development of commercial software, DMSO is providing open access to all specifications (e.g., Object Model Template data interchange format)**
- **Information source: HLA On-line (subscribe at http://hla.dmso.mil)**
  - **mailing list for updates on HLA and supporting software**

HLA Supporting Software:
Runtime Infrastructure (RTI) Software

- **Runtime Infrastructure (RTI) software is available and can be ordered from HLA homepage (http://hla.dmso.mil)**
  - **release includes RTI software; Installation Guide; User Documentation; Test Federate; sample applications**
  - **once registered you are automatically notified of new releases**
- **We port RTIs to the major platforms/operating systems**
- **RTI version 1.3 to be released in March**
  - **will have a complete set of HLA management services**
- **Thus far RTIs have been developed by FFRDCs (Lincoln Lab, Mitre)**
- **Initial commercial procurement of an RTI is underway; out late 1998**

HLA Supporting Software:
Object Model Support Tools

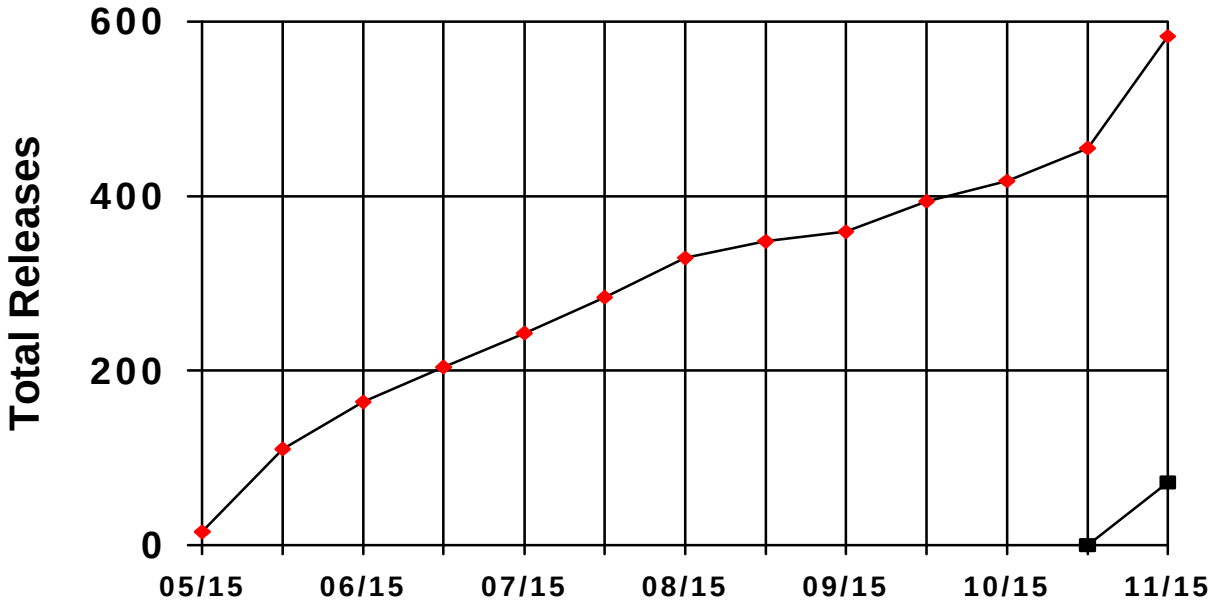
- **Object Model Development Tools (OMDTs)**
  - **Automated support for developing HLA Object Models (OMs), generating RTI federation execution data, and exchanging OMs with the Object Model Library**
- **Object Model Library (OML)**
  - **Web-accessible library for storing and retrieving completed HLA object models (SOMs and FOMs)**
- **Object Model Data Dictionary (OMDD)**
  - **an automated catalog of data elements for use in HLA object models**
  - **part of the data standards leg of the Common Technical Framework (Master Plan Objective 1-3)**
  - **will be linked to Object Model Development Tools**
- **Development of object model support tools is on track**
  - **OMDT and OML were released on 31 October**
  - **OMDD release and further tool enhancements forthcoming**

HLA Software Distribution Center

- HLA Software Distribution Center went on-line 31 October 1997
- Current products include six ports for RTI v 1.0.3, and OMDTv1.1.7
  - Additional products to be added as available
- Concept affords one-time registration and download from World Wide Web
  - Access via http://hla.dmso.mil under topic “HLA Software Distribution Center”
  - User defines own account name and password
  - User account approved following one-time submission of registration data
  - Approved users may access and download any products not previously downloaded

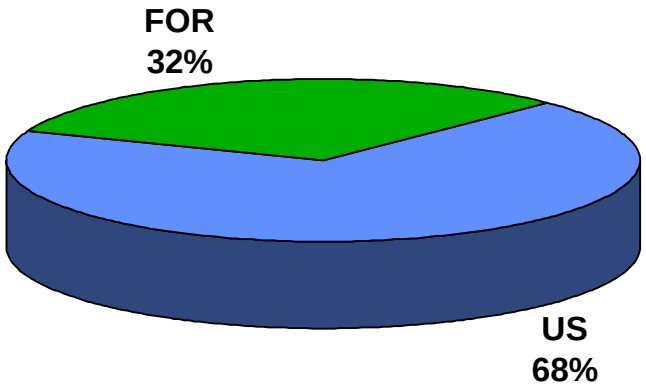
Note: Users previously registered and approved to download RTI under the old ftp site must re-register under the new HLA Software Distribution Center. The old ftp site is no longer populated.

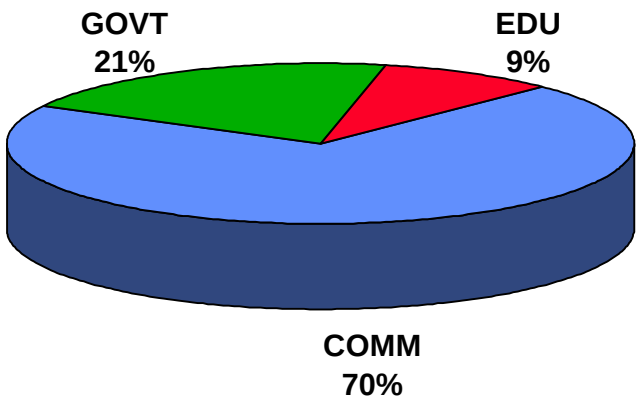
HLA Software Releases
through 15 November 1997



RTI - 583

OM Tools - 72





HLA Education/Outreach

- **Integrated DMSO HLA training program is underway, evolving in response to user needs**
  - **shifting from a "request-response" mode to scheduled events**
  - **introductory courses (regionally) and hands-on practicums**
  - **no cost to recipients other than TDY costs**
  - **sign-up via HLA home page (http://hla.dmso.mil)**
- **Open access to full HLA technical library, briefings, papers, etc., via HLA home page**
- **HLA help desk at MSOSA (e-mail to hla@msis.dmso.mil)**
- **Robust participation in major M&S forums outside DoD**
  - **MORS, SIW, SCS, ITEA, I/ITSEC, ITEC, NATO, allied nations, etc.**

HLA Compliance Testing

- Testing capability was put in place on 31 October
  - available at http://hlatest.msosa.dmso.mil
- Straight-forward, minimal effort required by federate
  - Test process is documented in an easy-to-use guide: procedures, submission formats, examples, etc.
  - Web-based, on-line test preparation and execution
- A natural and simple process for simulations which have complied with the HLA specifications

HLA Transition Support Summary

- HLA is evolving smartly, with the right players involved
- RTI software is available now, with follow-on versions in the pipe
- HLA Object Model Tools have been released
- A comprehensive information and education package is in place
- Compliance testing capability is in place

All the support required for HLA transition is in place

HLA Transition Plans of the DoD Components

HLA Transition Reports

- Team first prepared “bubble memo” to clarify policy memo terms
- Per USD(A&T) policy memo, DoD Components provided 30 June inputs to DMSO regarding HLA transition plans
- Very positive reports - strong commitment to HLA compliance
- Some inconsistencies in reporting criteria; team scrubbed
  - Sept 96 USD(A&T) policy tasked DoD Components to list their HLA-compliance intentions in three categories, but these weren’t clear as to “no can pay” and “no can play” dates
  - some inconsistencies in reporting simulations to be retired after FY01 (some requesting waivers, some not)
  - some Components reported Part Task Trainers (PTTs) and Cockpit Procedure Trainers (CPTs); others did not
- Team scrubbed

Team's Clarification

- All PTTs and CPTs were excluded as not required by policy
- Team decided further categorization was needed and established the following working categories:
  - Category 1: yes, to transition, within time limits
  - Category 2: yes, to transition, with time extension
  - Category 3: not to transition, requesting waiver; further sub-divided into
    - 3a - laboratory-based simulations
    - 3b - other simulations
    - 3c - awaiting replacement after "no can play" date
  - Category 4 - not to transition; retired before "no can play"
- Results of this clarification are shown on the next slide

Resulting Categorization of HLA Transition Plans

	Category 1	Category 2	Category 3			Category 4	total
	Yes, to transition within time limits	Yes, to transition with time extension	Not to transition for reason other than retirement (Waiver)			Not to be transitioned. To be retired	
			A	B	C		
Subtotals			89	80	68		
Totals	179	228	237			110	**754**

407 ***169*** ***178***

407 simulations committed to HLA compliance;
169 candidates for long-term waivers

as of 04 December 1997

Action Plan (1 of 2)

- Transition Issues Team is examining Category 3A and 3B (requesting long-term waiver) simulations
  - workshop on 15-16 October examined range of simulations in labs to understand where HLA is/is not appropriate
  - follow-on examination of other simulations as required
  - team will develop waiver criteria
- Components will apply waiver criteria and recategorize simulations accordingly
- DMSO will present a recommendation to the EXCIMS at its next meeting (notionally March 98) regarding needed policy clarifications and disposition of category 3 waivers
- USD(A&T) will act on this (March 98) EXCIMS recommendation in Spring 98

Action Plan (2 of 2)

- In parallel with this, sponsors of simulations committed to HLA compliance but lacking required funding will pursue resources in the FY00 POM/Budget process
- As the results of these efforts become clear, some further rebinning may occur (as fewer/more time extensions are required)
- Components will track scheduled replacements to identify slips requiring additional 3C (awaiting replacement) waivers
- HLA Transition Issues Team will prepare recommendations to the EXCIMS regarding required time extensions for simulations in Category 2 (yes to transition, with time extension) and any new additions to Category 3c (awaiting replacement).
- EXCIMS and USD(A&T) will act on these recommendations during fall/winter 1998

Challenges and Opportunities

- **Transition cost estimating**
- **Funding**
- **Federation development, including VV&A of federations**
- **Impact of HLA evolution**
- **Periodic reviews**
- **Others**

Summary

- HLA has been a DOD-wide team effort from the beginning
- A comprehensive support structure (e.g., software tools, testing, education, outreach) is in place to make sure the HLA transition succeeds
- Strong positive response to High Level Architecture as the standard technical architecture for all DoD simulations.
- The DoD Components are working HLA transition issues as a team, ensuring common sense prevails
- DoD's M&S strategy is being executed successfully; we're on course and making excellent progress

Audience Q&A

Questions?